

REMARKS

Rejections under 35 USC §112, First Paragraph

In items 1 and 2 of the Office Action, claim 1 is rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement.

Accordingly, we are enclosing, for your review and approval, proposed amendments to overcome the rejection.

Rejections under 35 USC §103(a)

Claims 1-7 are rejected under 35 USC §103(a) as being unpatentable over Takemoto et al. (U.S. Patent No. 5,198,041).

Claim 1 has been amended to recite “deforming a Fe-Mn-Si-based shape memory alloy containing Nb and C by a deformation ratio of from 10% to 20% at room temperature.”

Takemoto et al describes as follows:

In one test, the test piece was deformed at a temperature of 20°C, -73°C or -196°C by imparting a tensile strain of 4%. The deformed piece was heated at a temperature of 400°C for 15 minutes and allowed to cool to room temperature. Percent of shape recovery (Ro) was determined.

In another test, the test piece was deformed at a temperature of 20°C or -73°C by imparting a tensile strain of 6% (primary deformation), and the deformed piece was heated at a temperature of 600°C. for 15 minutes and allowed to cool to room temperature. The test piece so treated was again deformed at a temperature of 20°C or -73°C by imparting a tensile strain of 6% (secondary deformation), and the deformed piece was heated at a temperature of 600°C for 15 minutes and allowed to cool to room temperature. Percent of shape recovery (R_T) to the shape after the primary deformation was determined.

(Takemoto et al, column 7, line 49 to column 8, line 10). According to Takemoto et al, the test pieces are deformed only by 4% or 6%. Or, the test piece is primarily deformed by 6% and after heat treatment it is secondarily deformed another 6%. Thus, Takemoto et al does not teach or suggest “deforming a Fe-Mn-Si-based shape memory alloy containing Nb and C by a deformation ratio of from 10% to 20% at room temperature.”

As shown in Figs. 1 and 2, the test pieces which were deformed at the rolling ratio of 10% and 20% show excellent shape recovery. Such results are not expected from the disclosure of Takemoto et al.

More specifically, as is shown in Fig. 1, the sample rolled by 10% has shape memory recovery ratios nearly equivalent to or slightly lower than those of the alloy with no Nb, C addition which was subjected to training five times. Training of at least five times is necessary for obtaining the same shape recovery ratio as this sample, with a conventional Fe-Mn-Si-based shape memory alloy with no Nb, C addition. As is understood from this, the present invention exhibits shape memory properties with a simple method.

The sample with a higher rolling ratio of 20% has shape memory recovery ratios nearly equivalent to or slightly higher than those of the case without rolling (only aged). However, the sample with a further higher rolling ratio of 30% has shape memory recovery ratios lower than those of the case which was only aged in a range with large initial strain.

On the other hand, as for shape recovery stress which is one of the important shape memory properties for practical use, the shape recovery stresses of samples aged after rolling by

Amendment under 37 CFR §1.116
Application No. 10/519,255
Attorney Docket No. 043075

20% and 30% are remarkably improved. Fig. 2 shows the degrees of improvement in shape recovery stress of these samples, in comparison with the case in which only aging was conducted (0% rolling) and a case in which the aging was conducted after rolling by 10%.

Thus, Figs 1 and 2 shows that samples deformed at ratios of from 10% to 20% at room temperature show excellent results in both shape memory recovery ratio and shape recovery stress. Such results are not expected from the disclosure of Takemoto et al.

For at least these reasons, amended claim 1 patentably distinguishes over Takemoto *et al.* Claims 3-7, directly or indirectly depending from claim 1 also patentably distinguishes over Takemoto et al for at least the same reasons.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Amendment under 37 CFR §1.116
Application No. 10/519,255
Attorney Docket No. 043075

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

A handwritten signature in black ink, appearing to read "Sadao Kinashi", written in a cursive style.

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